

PISTON FOR A HYDRAULIC DASHPOT,

AND METHOD OF MANUFACTURING SUCH A PISTON

Sub B1
The present invention concerns a piston for a hydraulic dashpot as recited in the preamble to Claim 1. The invention also concerns a method of manufacturing such a piston.

Dashpots for motor vehicles are intended to attenuate the vibrations of the spring-suspended wheels, Such dashpots usually include a piston mounted on one end of a piston rod and traveling back and forth inside a cylinder.

A piston of this genus is known from German Patent 969 330. This device includes a one-way valve in the form of a cup spring or stack of cup springs subject to the force of a compression-application mechanism mounted on a threaded bolt. The valve's resilience is adjusted by rotating the compression-application mechanism.

The piston described in the aforesaid patent is accordingly adjustable, but extremely complicated, and must also be manufactured to very precise tolerances.

Sub B2
The object of the present invention is a piston with a valve, particularly a cup spring or stack of cup springs, with aa resilience that can easily be adjusted over a specific range. As in the piston described in German Patent 969 330, moreover, the resilience in the suction phase will be adjustable independently of the resilience in the compression phase and vice versa.

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2 This object is attained in accordance with the present
3 invention by the characteristics recited in the body of Claim
4 1. Advantageous further and advanced embodiments of the
5 invention are addressed by Claims 2 through 10.

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7 Claims 11 through 13 recite a method of manufacturing such a
8 piston, and Claim 15 recites an advantageous way of attaching
9 the piston to a piston rod.

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11 The present invention has several advantages. Although the
12 piston is simple, it can easily be employed to precisely vary
13 the hydraulic impedances of both the compression phase and the
14 suction phase. The tolerances involved in manufacturing the
15 piston can accordingly easily be attained. The piston's
16 characteristic curve can also be easily adjusted in both the
17 compression and the suction phase. Finally, the piston can be
18 produced simply and cost-effectively.

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20 The present invention will now be specified with reference to
21 the drawing, wherein Figures 1 through 4 are sections through
22 different embodiments of a piston in accordance with the
23 present invention and illustrate different approaches to its
24 manufacture.

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26 A piston 1 is conventionally mounted on one end of a piston
27 rod 3 and travels back and forth inside a cylinder 2. Although
28 the piston in the present embodiment is screwed onto the
29 piston rod, other means of attachment are also possible.

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1 Cylinder 2 is full of hydraulic fluid and is divided by piston
2 1 into two chambers 4 and 5. Piston 1 is provided with
3 channels 6 and 7, each of which can be opened and closed by
4 one-way valves in the form of stacks of cup springs, channel 6
5 by cup springs 8 and channel 7 by cup springs 9. The body 10
6 of piston 1 is in three parts, specifically a bolt 11 and two
7 halves 12 and 13. Piston 1 is wrapped around by a binding 14
8 in the form of a band of low-friction plastic. Bolt 11 is
9 provided with threads 15 at one and threads 16 at the other.
10 The components of piston 1 are held together by nuts 17 and 18
11 at each end and by a washers 19. Cup springs 8 and 9 are in
12 direct alignment with the body 10, and hence with the halves
13 12 and 13, of piston 1. Cup springs 8 and 8 can be tensioned
14 against body 10 by rotating nuts 17 and 18 and washer 19,
15 axially deforming halves 12 and 13 between the cup springs
16 resiliently or even plasticly. This action requires the
17 circumference of cup springs 8 and 9 to rest snug against
18 outer annular sealing edges 20 and 21 on body 10. The tension
19 applied by cup springs 8 and 9 can accordingly be varied.

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21 The piston 1 illustrated in Figure 1 is provided with a bolt
22 11 surrounded by a collar 22. Collar 22 rests in depressions
23 in halves 12 and 13 and is accordingly accommodated in them
24 both axially and radially. Any tolerances or intentional play
25 left between collar 22 and halves 12 and 13 can be compensated
26 by a applying a hardening casting mass, achieving an
27 especially axially solid attachment between the halves and the
28 collar. The surfaces of contact between cup springs 8 and 9
29 are established by compression disks 23 and 24, facilitating

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the desired resilient or plastic deformation by way of prescribed screwing forces.

The upper threads 15 on bolt 11 are welded into a shock-accommodating disk 25, fastening piston 1 to piston rod 3 and allowing adjustment of cup springs 8 and 9 to both the compression and suction phases by rotating nuts 17 and 18.

The bolt 11 in the embodiment illustrated in Figure 2 is composed of two halves 26 and 27 originally provided with heads 28 and 29. The two halves are positioned with their heads together and for example welded, creating collar 22, subsequent to which bolt 11 can be further fastened together as specified with reference to Figure 1. Halves 26 and 27 can, however, alternatively be cemented together along with their heads. Piston 1 is fastened to piston rod 3 as specified with reference to Figure 1 except that the shock accommodation is provided by washer 19, which simultaneously applies tension to upper cup springs 8. The head of bolt 11 is provided with a hexagonal recess 30 instead of a nut. Upper cup springs 8 can be tightened and tensioned as specified with reference to Figure 1 by means of nut 18 once upper cup springs 8 have been appropriately adjusted.

The facing surfaces of the piston halves 12 and 13 in the embodiment illustrated in Figure 3 are provided with depressions 31. In this embodiment as well, halves 26 and 27 the two halves are cylindrical, at least in the vicinity of body 10. Body 10 is designed to allow the halves to be

1 fastened together by burn-off butt welding for example,
2 creating an outward-directed welding bead that fills
3 depressions 31. Halves 26 and 27 and depressions 31 are
4 relatively dimensioned to ensure that the bead will entirely
5 occupy the depressions. Cup springs 8 and 9 can be tensioned
6 by clamp connections 32 and 33, by welding, or by nuts 17 and
7 16.

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10 To facilitate positioning and securing piston halves 12 and 13
11 in relation to collar 22 or heads 28 and 29, the surfaces of
12 depressions 31 can be provided with knife-like radial or axial
13 elevations that dig into collar 22 or heads 28 and 29. With
14 piston halves 12 and 13 appropriately oriented in relation to
15 piston rod 3 and to bolt 11 or halves 26 and 27 accordingly,
16 the arrangement will be stable both axially and radially no
17 matter how the system is finally assembled.

18 The piston halves 12 and 13 and bolt 11 in the two versions of
19 the embodiment illustrated in Figure 4 can be fastened
20 together in various ways. The bolts in both versions are
21 composed of two halves 26 and 27 welded together inside piston
22 halves 12 and 13. The bolt halves in the version represented
23 in the left half of the figure are provided with collars 34
24 and 35 that, once the bolt halves have been connected, rest
25 against the faces of the piston halves. All the components of
26 body 10 are accordingly assembled together.

27
28 The mutually contacting surfaces of the piston halves 12 and
29 13 in the version represented in the right half of Figure 4

1 are provided with inwardly projecting noses 36. Once the
2 halves 26 and 27 in this version have been welded together to
3 create bolt 11, again cylindrical in the vicinity of body 10,
4 the overall assembly will be stable.

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